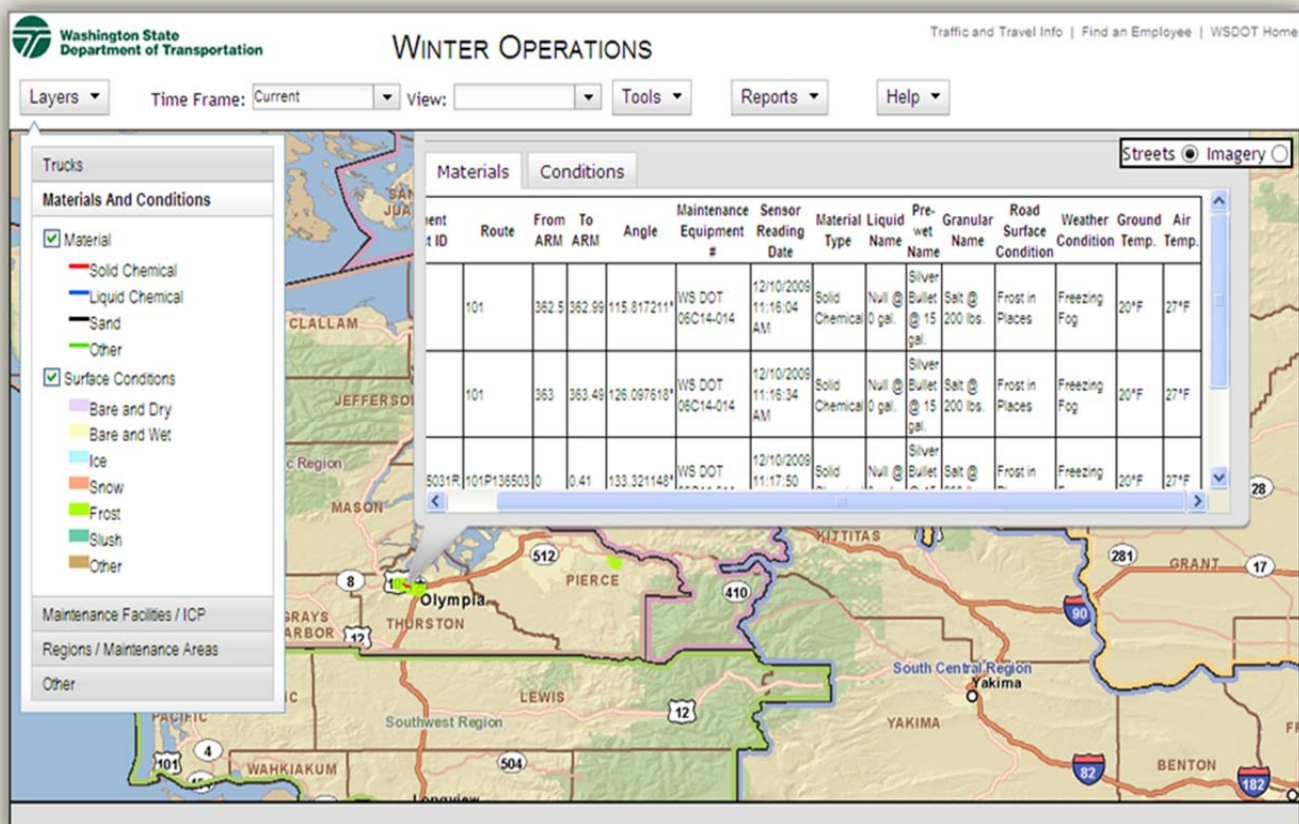


# Chapter 2

## MAP\* Snow and Ice Level of Service Data Collection Processes Statewide Weather Forecasting Services



\*Maintenance Accountability Process

## MAP Snow and Ice Level of Service (LOS)

**What:** WSDOT snow & ice operation performance is measured in terms of the results of these operations. The most important overall result is the condition of the travel lanes provided by maintenance actions (i.e. anti-icing, deicing, or plowing) during winter conditions (i.e. snow, ice, frost). Performance measurement information is used to determine the Level of Service (LOS) provided by the maintenance program throughout any given winter season. LOS ratings can be determined on different scales that range from statewide to route specific.

**When:** Road surface conditions are assessed after snow and ice response activities occur during the winter season. There are no specified days or times during which road surface conditions should be documented. Assessment and documentation should be made after the activity is completed and the outcome (i.e. bare pavement, wheel tracks bare, etc) is known. Maintenance personnel should assess and document road surface conditions in the course of their daily work as opposed to making a special trip to a specific location solely to document road surface conditions.

**Where:** Road surface condition outcomes as a result of winter maintenance operations can be documented at any location where such operations were performed.





**How:** Maintenance personnel conduct the condition assessments by observing the surface condition of a roadway (all lanes, both directions). Observations are documented on the winter maintenance Personalized Digital Assistant (PDA) application, or entered into the data collection device attached to the data modem in AVL/GPS equipped trucks.

**Ratings:** Road surface conditions are assigned different point values based on the assessed condition of that roadway. The point values are used to calculate the LOS ratings. There are two classes of road surface conditions on the form that represent the two primary methods by which WSDOT provides snow and ice control. One is to enhance traction on top of snow/ice by spreading abrasives (i.e. sand) on the travel lane. The other is to attempt to provide a bare pavement surface by applying chemicals to the travel lane. Point values for different conditions are as follows with commensurate LOS ratings:

Road Condition Rating for Sand Treatment	Points	LOS Rating
100% of roadway has sand present	3	C+
50% or more of roadway has sand present	3.5	C
All emphasis areas have sand present	4	D+
50% or more of emphasis areas have sand present	5	F+
50% or less of emphasis areas have sand present	5.9	F
Unable to evaluate	-	-

Road Condition Rating for Chemical Treatment	Points	LOS Rating
Bare Pavement	1	A+
Patches of frost, black ice, slush, or compact.	1.5	A
Wheel tracks bare, frost, snow, or ice encountered.	2	B+
50% of roadway with compact snow and ice.	3	C+
Entire roadway covered with compact snow and ice.	4	D+
Unable to evaluate	-	-

Note: Emphasis Areas include hills, bridges, curves, intersections and known problem areas.

Expected Season LOS	Expected Road Condition after Treatment Completed
<b>A to B</b>	<p>Snow or ice buildup encountered rarely. Bare pavement attained as soon as possible. Travel delays rarely experienced.</p> 
<b>B to C</b>	<p>Snow or ice build up encountered at times but infrequent. Travel at times may experience some isolated delays with roads having patches of black ice, slush, or packed snow.</p> 
<b>C to D</b>	<p>Snow or ice buildup encountered regularly. Travel likely to experience some delays with roads having black ice or packed snow with only the wheel track bare.</p> 
<b>D to F</b>	<p>Compact snow buildup encountered regularly. Traveler will experience delays and slow travel.</p> 
<b>N/A</b>	<p>Closed periodically or for the duration of the winter season.</p>

## Data Collection Process



### PDA Winter Operations Application:

In the fall of 2002, WSDOT embarked upon a pilot project to collect and manage data from the snow and ice program more effectively. Previously there was no universally applied standard for data collection, or for documentation of our efforts. The goal of this project was to document where and when we applied material, how much material we applied, and to measure the outcome of our efforts. Prior to this project, information retrieval was a cumbersome process which could take weeks or months.

A program was written to run on the Personal Digital Assistant (PDA) for download into a central database. Ease of use by the equipment operator and the collection of common data elements were the primary goals. The initial implementation was limited in scope due to the limited number of PDA's available. The Department systematically began buying and deploying units every year until each and every employee had their own personal PDA, or access to a shared PDA.

The PDA program has improved over the ensuing years with employee feedback. The current version includes many new information elements on drop down menus. Furthermore, the new application is adaptable to the individual employee or to the specific organization. Employees can limit the number of items that the drop down menu displays to those elements that they use most frequently.

The current version of the winter ops PDA program also incorporates the Maintenance Accountability Process (MAP) level of service rating system, which is described above. This will give the Department additional tools by which to evaluate the outcomes of our operations.

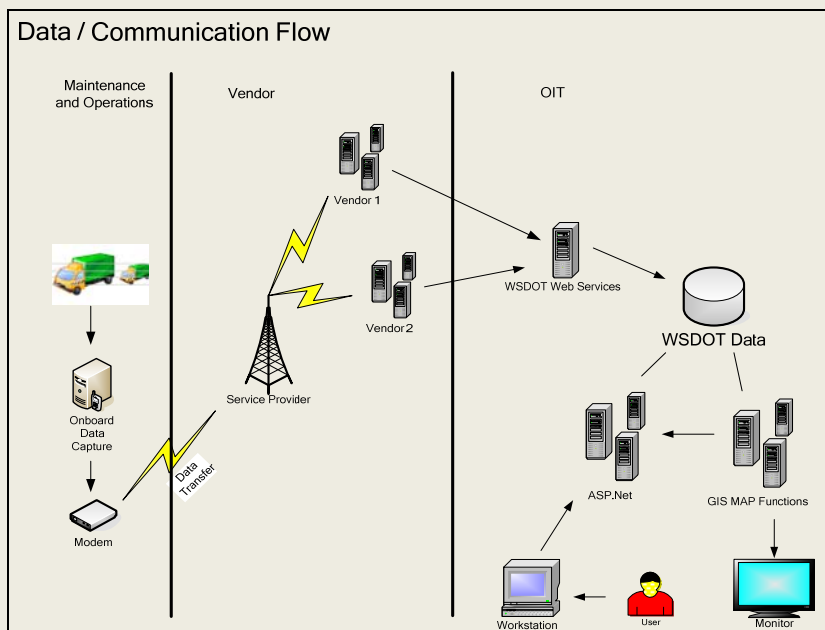
## Winter Operations Automatic Data Collection:

Beginning with the winter of 2007-2008, WSDOT has been gradually implementing automatic data collection hardware and software, to include a database system with a GIS map interface. This interface was developed in-house by the WSDOT IT Office. During that first winter, 50 trucks statewide were equipped with automatic data collection devices. These data collection devices provided real-time operational information through multiple data systems vendors to the WSDOT developed database using cell phone and 802.11 connectivity.

This project has expanded in each of the following seasons to include additional maintenance areas, trucks, and vendors. Currently, more than half of the winter fleet is equipped with data collection devices, and progress has been made in adapting additional precision controllers to data devices capable of interfacing with the WSDOT database. The program has been extended into all regions, and where cell coverage is spotty an IP Radio solution has been implemented.

Ultimately, all WSDOT snow and ice response equipment will be set up with precision material controllers and data collection devices. The statewide implementation of this program will eliminate the need for PDA data collection, or manual data entry on PCs, and allow operators to concentrate solely on critical functions in snow and ice control. It will also provide accurate real-time and historical information for managers and supervisors to assist in planning and implementing more efficient responses to snow and ice events. In the interim, PDAs, PC data entry, and automated data collection through the AVL/GPS Program are all utilized to provide a complete overview of winter operations activities.

## Automatic Data Collection Business Flow:



The above diagram depicts a state-wide data collection and mapping system on the web. The trucks capture data from onboard sensors and components, send it through a service provider (cellular, radio, 802.11 etc.) to a specific vendor site. WSDOT can poll the vendor site periodically and pull the data into the WSDOT internal system.



## Examples of business problems we expect to be answered with the Automated Data Collection Program:

- How much deicer have we applied in the last 24 hours on a specific section of highway?
- What resources are deployed for any given maintenance area?
- Do we need to adjust or add resources?
- What were the road conditions over a given time period?
- Were our operations effective in returning road surface to bare and wet?
- Are we providing a consistent level of service from area to area?
- Are we meeting our service level goals

## Statewide Weather Forecasting

Good winter maintenance response decisions are heavily reliant on accurate weather forecasting. Crew scheduling, equipment deployment, material stockpiling, and material application rates are examples of elements which are dependent upon accurate weather forecasting. All of these decisions correlate directly to our ability to provide winter time mobility, keep passes open, and work within budget constraints.

Northwest Weathernet, Inc. (Weathernet) is the contract forecast provider for WSDOT. Weathernet provides area specific weather forecast services and 24 hour a day support consultation via toll free phone lines to WSDOT Maintenance personnel. Text forecasts (of an agreed upon format), are generated twice daily during the winter months - October 1<sup>st</sup> through April 30<sup>th</sup>. Forecasts include narratives for all maintenance areas and site-specific forecasts for each maintenance section within the maintenance area. Written forecasts are made available to authorized persons on the Weathernet Website, and sent via email or fax to requested locations. Weathernet meteorologists monitor weather conditions throughout the state and will provide alerts to WSDOT personnel for any abrupt changes to the forecast. Weathernet meteorologists archive daily forecasts and communications, and document storm events for future evaluation.

